

# Homing Instincts

## Objectives

Students will 1) trace and label the migratory route that Chinook salmon take from the ocean to the American River, 2) describe one theory about how a salmon can find its birth stream, and 3) explain how adaptations enable some species to survive and maintain their populations.

## Curricular Areas

Science, Language Arts, and Environmental Education

## California Content Standards

*GRADES 3-8 (can be adapted for K-2)*

### Science

3rd Life 3 a, b, c, d; Investigations 5 b, d, e  
4th Life 3 a, b; Investigations 6 a, d  
5th Earth 3 a; 4 a, b, c; Investigations 6 b, d, h  
6th Earth 2 b; Investigations 7 d, e, f, g, h  
7th Genetics 2 c; Evolution 3 a, b, e; Living Systems 5 a, b, c, d, 6 a; Investigations 7 a, c, d, e

### Social Studies

3rd 3.1  
4th 4.1, 4.4

### English Language Arts

3rd Speaking 1.0, 2.0  
4th Speaking 1.0, 2.0  
5th Speaking 1.0, 2.0  
6th Speaking 1.0, 2.0  
7th Speaking 1.0, 2.0

## Method

Students participate in map and simulation exercises that help them understand the migration of the Chinook salmon.

## Materials

- Time to complete: (1) 50-minute class period
- A map of the California river system (or local maps)
- pencils
- crayons and markers
- 35 envelopes
- facial tissue
- ball of blue yarn
- five scents such as garlic, vanilla, lemon, pineapple, maple, peppermint, chocolate or anise
- slips of paper, numbered from 1 to 5 (seven of each number)

## Background

Salmon begin life as eggs in the gravel of a stream. They migrate down rivers and spend several years in the ocean. Then, at a certain time, the salmon swim back to their “home” rivers and migrate upstream to their exact birthplaces to spawn.

For many years, the mechanism by which salmon and steelhead found their home stream was a mystery. Scientific research indicates that salmon may use currents as well as an orientation to the earth’s magnetic field and celestial (sun) navigation. However, once they enter the rivers, the sense of smell is their guide home. Each stream has its own characteristic scent developed from the vegetation along the stream, the rocks that the stream covers, and the water entering the stream from small streams and springs. This adaptation is important for the salmon to reproduce and survive. Students might give some thought to how well they would find their own homes if they had to rely only on smell.

The purpose of this activity is to demonstrate that organisms exhibit adaptations to the environment in which they live, and that these adaptations maximize the survival of the species.

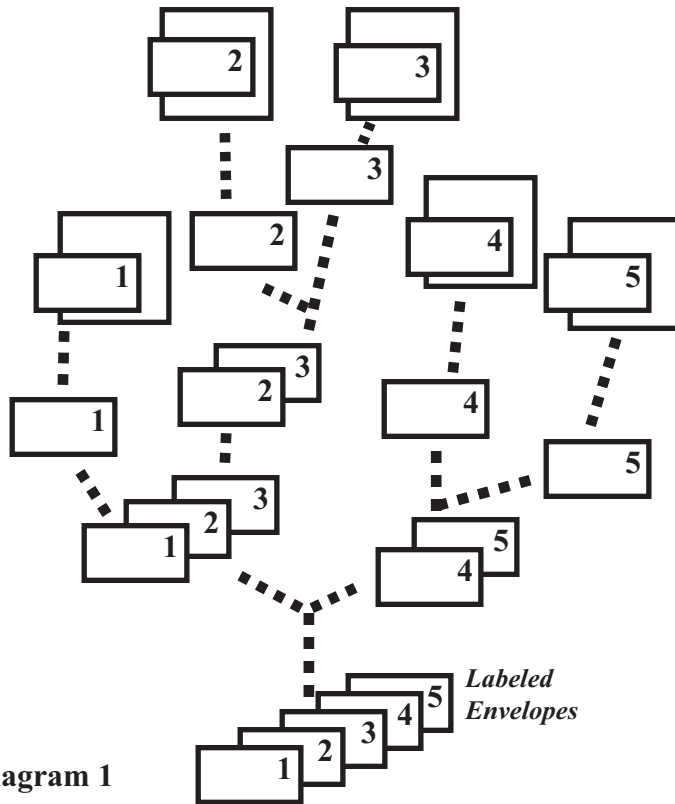
## Procedure

Before class:

Prepare the scent envelopes.

- Make six envelopes for each scent (except peppermint).
- Put two drops of a scent on a tissue and seal it in an envelope.
- Clearly label only one envelope of each scent with a number (1 to 5).
- Make five envelopes with crumpled tissue without scent.

Around the room (or outside) set up your river system (see Diagram 1). Blue yarn will represent the river. Place the unmarked envelopes according to their number. Under the last envelope place



**Diagram 1**

a piece of paper with the number.

During class:

1. Discuss the sense of smell, and ask students if any odors cause them to remember something special.
2. Review the fish anatomy. How do salmon smell? Salmon use the two comma-shaped holes on either side of their head, below the eyes. Water flows in one hole and out the oth-

er over the olfactory receptors, which absorb molecules from water that convey information to the fish about its environment. With these receptors, salmon can detect minute amounts of dissolved substances. A salmon's sense of smell is much more acute than a human's.

3. Briefly review the life cycle of the salmon. This activity covers the return of the salmon to their home stream.
4. Students will have the opportunity to see how they would do at finding their home stream. Pass out the numbered slips of paper. The number represents the student's home stream. Provide each student with the corresponding number envelope; this is the smell of their home stream. As salmon fry, they imprint this scent to use for their return migration. Collect the envelopes for use later.
5. Divide students into groups of four. Provide each group with a map showing the Sacramento Valley water ways and drainage system. (Map included at activity conclusion). Time spent on this activity will simulate the time spent in the ocean.
6. Ask students to trace the route of the Chinook from the ocean to the American River spawning grounds. They need to locate and label the ocean, bays, delta, rivers and dams along the Chinook journey.
7. Discuss the groups' results. What is the class's consensus of the journey?
8. Bring the class to the mouth of your river system. Explain that they are to find their home river by following the smell. Students must remember the scent in their envelope. After all students have arrived at their spawning grounds, check the numbers. Ask how many were successful in their return.
9. If time permits, modify and repeat the scent activity. While students return to their groups and list obstacles from the mapping activity that the salmon encountered on their return trip, rearrange the river system (see Diagram 2). Add peppermint (representing scent pollution) to all number 1 envelopes. Replace number 4 envelopes with the unscented ones (representing a stream without water-drought

or diversion).

10. Have students return to your river system for a second migration. What were the results of this second migration? What did the peppermint represent? What happens when there is a dry stream?
11. Review the students' list of obstacles from the mapping activity. Were any of the obstacles similar to those experienced by the students during their migration activity?
12. Have a class discussion of the following:
  - The scent of each river or stream is unique and continuous throughout the river system
  - Conditions in each stream are different; chances for survival are better in a salmon's home stream
  - Fish that "stray"(return to systems other than their own) can add genetic diversity,

allowing a population to have genetic makeup to adapt to changing conditions. However, too many strays can dilute the genetic makeup of the population, making it less adapted to its unique conditions.

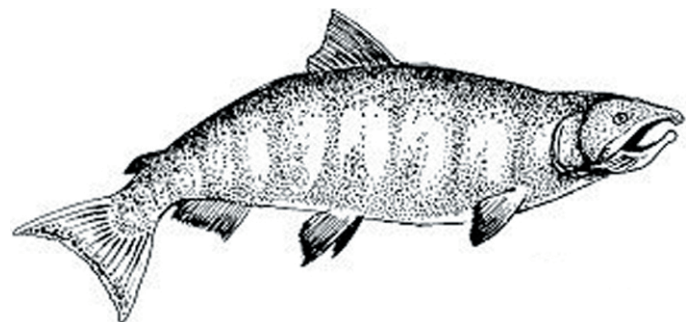
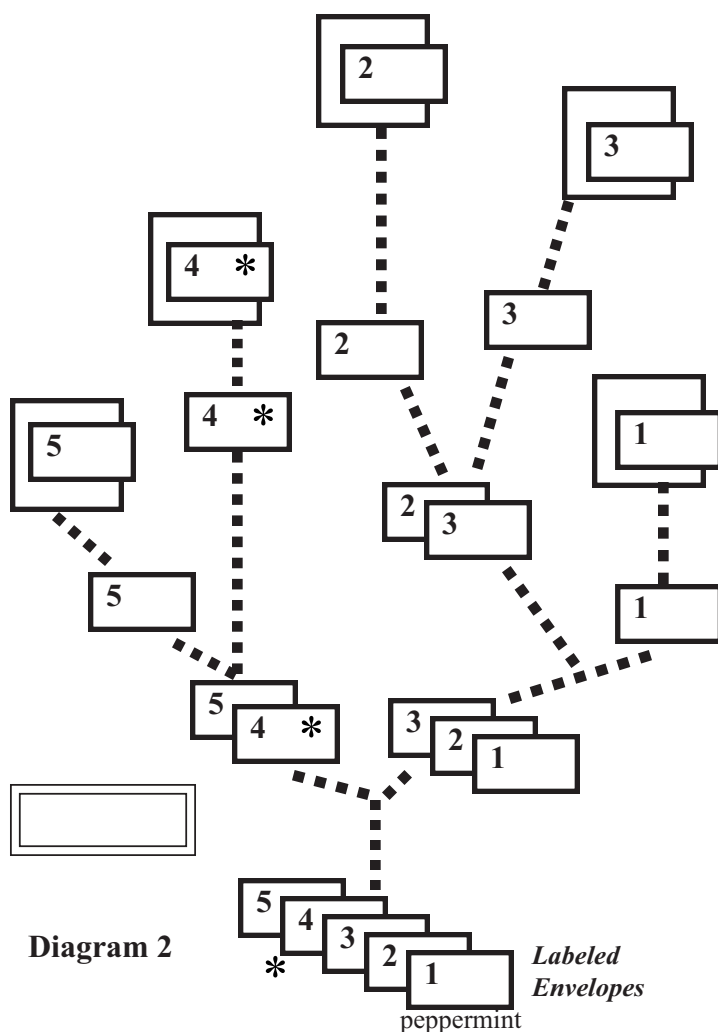
13. Ask students what kind of experiments scientists might have used to discover the means by which salmon find their home streams. Scientists captured salmon returning to a hatchery and then released them after blocking their vision or sense of smell. They also released some that had not been altered. Few of the fish whose sense of smell had been blocked returned, while many of the others did.

## Extensions

1. Ask students to create either visual images or a piece of creative writing that describes the life of the Chinook.
2. Ask each group to choose another animal that migrates (bald eagle, yellow-rumped warbler, monarch butterfly, elk, etc.) and to develop a class presentation (verbal or visual) describing that migration.
3. Ask each group to choose another species of salmon and investigate its life cycle and migration.

## Evaluation

- Participation in the closing discussion can



Activity adapted with permission from *Some Things Fishy, A Teacher's Guide for the Feather River Fish Hatchery*, published by the CA Department of Water Resources, Office of Education.

